

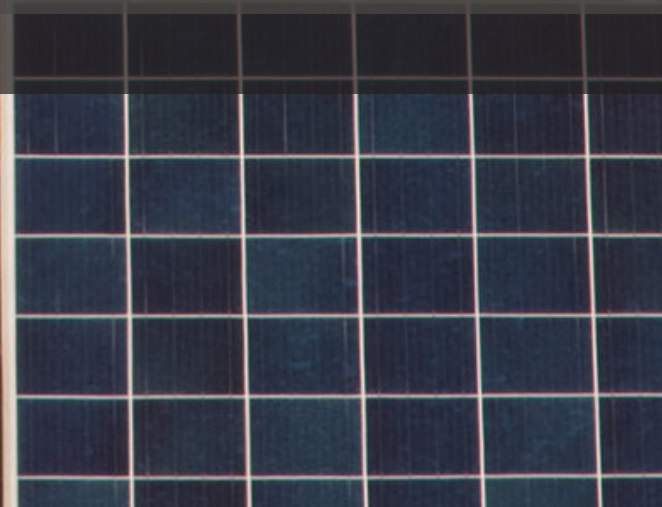


Low-Income Community Solar Demonstration Project Case Study: Yampa Valley Electric Association

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COLORADO
Energy Office



Project Details

Yampa Valley Electric Association's Demonstration Project Highlights

- The project supports YVEA's goal to produce more electricity locally.
- Subscribers are capped at 5.3kW due to the small size of the system, which will allow for an average project cost savings of 42%.
- On average, subscribers will realize annual cost savings of \$360, and when combined with average cost savings of \$200 from CEO's WAP, subscribers could see annual savings of \$560.
- YVEA will work with GRID, CEO's weatherization assistance program and local partners to ensure that clients receive energy efficiency education and services.

INTRODUCTION

Approximately 30% of Colorado households pay more than 4% of their annual income on energy bills. Although several financial assistance programs exist to relieve high energy burden for low-income households, additional opportunities remain to achieve deeper cost savings by specifically targeting reductions in electricity costs.

The Colorado Energy Office's (CEO) Weatherization Assistance Program (WAP) is dedicated to improving energy affordability for low-income households. Guided by this commitment and in response to a gap in electricity cost reduction programs, CEO launched the Low-Income Community Solar Demonstration Initiative in 2015. The Yampa Valley Electric Association demonstration project is part of the statewide initiative that aims to reduce electricity costs for low-income households by offering community solar options to households that are eligible for weatherization services.

OBJECTIVE

The demonstration project has eight utility partners, including the Yampa Valley Electric Association (YVEA), a cooperative utility that provides electric services for more than 19,924 residents and businesses located in Eagle, Grand, Routt, and Moffat counties. This case study describes YVEA's income-qualified community solar project and informs utilities, governments, and policy makers how community solar projects can impact low-income communities.

PROJECT PARTNER ROLES

YVEA partnered with CEO and GRID Alternatives (GRID) to develop a 165-kilowatt (kW) community solar array that will support up to 45 low-income co-operative members at a time. The primary goal of the project was to reduce costs for low-income households and increase the amount of local renewable energy on YVEA's grid.

Each partner played a key role and will continue to play a key role moving forward:

- CEO identified the demonstration project opportunity and provided funding support and project evaluation.
- GRID developed the design and implementation framework; designed and led the installation of a new 165 kW system; provided everything "behind-the-meter" including all equipment panels, inverters, balance of systems, and labor; developed the workforce training program; and provided communication and outreach support. GRID will maintain equipment warranties.
- YVEA provided funding support, the land and interconnection, conducted outreach, and managed subscriptions. YVEA will provide program administration, maintain full ownership, and conduct all operation and maintenance (O&M) activities.

PROJECT IMPLEMENTATION

In 2014, YVEA partnered with a private company to offer community solar to YVEA subscribers. In the model offered by the company, subscribers paid for panels upfront and were dependent on high solar production to ensure that their investment was returned. While the project was popular, in the first year, production was low due to weather and many subscribers were surprised by their minimal returns. In addition, with this model, YVEA had little control over what was offered. As such, YVEA was interested in pursuing another community solar project but wanted to own the array, offer more consistent returns, and have more control over how the project was implemented.

In 2015, GRID approached YVEA to see if they would like to take part in the demonstration project. YVEA was interested because they would own the solar and it would support low-income residents. In addition, YVEA was interested in the ability to produce energy locally.

“YVEA is proud to help develop a renewable energy project that touches so many people. This project is a perfect pilot for YVEA-owned solar generation—allowing a portion of our membership that often can’t access renewable energy to benefit at an affordable cost, helping students and trainees who are building careers in the industry, and bridging what is sometimes a divide between solar advocates and utilities. We believe that many ‘right’ answers exist for the future of energy, and we expect to embrace varied and innovative fuel choices.” - Diane Johnson, YVEA CEO

During the summer of 2016, the demonstration project was approved by YVEA’s Board. The community solar array was interconnected into YVEA’s grid in November 2016. Subscribers were selected in October and November, with 80% subscriptions achieved by December. Due to lower-than-expected production in the previous community solar project, YVEA decided not to fully subscribe their model the first year to ensure that the array was performing correctly. In 2018, YVEA plans to subscribe the remaining 20%. Current subscribers received their first financial benefit in April 2017.



YVEA may refer subscribers and deny subscriptions due to poor credit history, history of unpaid bills, and/or illegal activity. YVEA has committed to providing subscriptions for 20 years, with individual subscriptions lasting five years.

The project was implemented using a turnkey installation in a “barn-raising” community development model, where subscribers donated 16 hours of sweat equity and worked alongside GRID, Girl Scouts, and YVEA. The panels were installed on YVEA property and interconnected directly to YVEA’s electric grid.

ENERGY GENERATION

Before the project, much of YVEA’s staff had little to no experience operating and maintaining renewable energy systems. GRID helped train YVEA staff and helped them understand their new role as a generation utility and the additional responsibilities that come with that role such as advanced billing.

Also, due to the array’s small size, it is recognized as a qualifying facility under Public Utility Regulatory Policies Act (PURPA). A qualifying facility can either be a small power production facility (under 80 MW) or a cogeneration facility. Since the array was a qualifying facility, YVEA was not required to have Xcel’s permission to install an array.

PROJECT COSTS

The project cost \$333,416, with \$225,000 covered by CEO’s grant and \$108,416 contributed by YVEA. Direct project costs included operations (such as equipment, construction materials and GRID staff time), outreach, and administration. Operations accounted for approximately 94% of total project costs, while outreach and administration accounted for approximately 5% and 0.05% of project costs, respectively. YVEA was able to cover all costs from internal funds and provided in-kind support including billing software, ongoing program administration, and the donation of land. YVEA expects that it will take 24 hours of administration time annually to run the program, which will keep administration costs to a minimum.

The total cost per watt was slightly lower than CEO’s other low-income community solar demonstration projects since the array was larger than most other projects, which optimized economies of scale.

PROJECT PRODUCTION

The estimated annual kilowatt hour (kWh) production of the solar garden was modeled using PVsyst. Long-term degradation is assumed to equal 0.7% per year. In Year 1, the system is expected to produce 198,612 kWh. Actual production data from November 2016 through June 2017 shows that the system produced 106,729 kWh, while estimated production during that same period was 112,501 kWh. During this timeframe, the system has produced 5% less electricity than expected.

Note that in November and December 2016, the solar array was being commissioned and some parts needed to be replaced leading to significant underproduction during those months. Since then, most months have shown that the array is performing well above expected. If you only include January through June of 2017, the system has produced 13% more electricity than expected.



PROJECT OUTREACH

YVEA and GRID used a variety of marketing platforms including program brochures, mailers, promotion on YVEA's website, and direct outreach to members. YVEA and GRID also hosted several informational workshops where attendees were asked to bring their 2015 Federal Income Tax Return or other proof of income and a recent YVEA energy bill. In order to qualify, subscribers had to be in good standing with YVEA and have a total household income at or below the 80% United States Department of Housing and Urban Development defined Area Median Income (AMI) levels for their corresponding county (Eagle, Grand, Moffat, or Routt). At the end of the workshop, attendees could sign up.



“YVEA wanted to ensure that solar was available to everyone. Historically solar was perceived to be a rich person’s game. This project allowed everyone to benefit.”

– Diane Johnson, YVEA CEO

GRID made direct phone calls to various members and targeted households that had previously benefited from CEO's weatherization services.

Since the Sustainability Council is a trusted organization by many low-income households in the community, it helped market the YVEA community solar array, in addition to its energy efficiency programs.

SUBSCRIBER STATISTICS

When fully subscribed, the 165-kW solar garden will serve around 45 subscribers, with each utilizing varying amounts of solar energy from the garden. In 2017, system sizes range from 3.18 kW to a maximum of 5.3 kW, with an average system size of 5.2 kW. In future years, this range may change. Subscribers will receive benefits for a five-year period and can reapply for participation in the future.

Originally YVEA had hoped to offset an average of 70% of each household's electricity use, based on the subscribers' previous 12-month electricity consumption. However, many subscribers used electric heat which drastically increases electric demand. For example, the range of annual electricity used by subscribers ranged from 2,380 kWh/year to 23,855kWh/year. To offset 70% of an electric-heated household demand, YVEA would have had to allocate a much larger amount than the 5.3 kW maximum.

COST STRUCTURE

The subscriber pays YVEA the retail rate for electricity consumed plus fixed monthly charges of \$27.50 each month. Fixed charges include a monthly base charge. In return, YVEA provides a bill credit to subscribers for the electricity produced by their panels.

The 2017 base residential retail rate is \$0.08321/kWh and is expected to increase every year. Subscribers will pay YVEA \$0.03/kWh for solar electricity consumed plus fixed monthly charges of \$27.50. The bill credit is the difference between the retail rate and the amount YVEA is charging subscribers for solar electricity (\$0.03/kWh). In 2017, the bill credit is \$0.05321. The solar payment will remain fixed for the term of the contract. This provides subscribers insulation against rising electricity costs and helps subscribers budget for long-term energy costs.

“A steady bill is as important as a low bill.” – Diane Johnson, CEO

On average, YVEA's project is expected to save each subscriber approximately \$360 each year. Assuming average annual electric costs of \$988, this community solar garden, when combined with potential cost reductions of \$200 achieved through CEO's WAP, could reduce low-income subscribers' annual energy costs by approximately 57%.

YVEA'S NEXT STEPS

The community solar project is part of a larger plan to increase the amount of renewable energy and clean fuels on the grid to meet subscribers' demand for a more diverse energy portfolio. YVEA noted that if this project succeeds, YVEA would be interested in creating another low-income community solar project. YVEA also will continue to encourage and deploy energy efficiency technologies throughout their territory.

Subscriber Spotlight: Julie Carey

Julie Carey runs a successful daycare center out of her house and at any given time she has up to five kids running, playing, and sleeping. Her students' comfort is her upmost priority; however, keeping her house at a comfortable temperature proved to be an expensive struggle. Her 1929 house was built with no insulation, and older windows all of which lead to especially expensive utility bills during the cold Steamboat Springs winters.

"I worked with Yampa Valley Sustainability Council and had an energy audit completed. They helped me with insulation, window sealing, and a number of other things." - Julie Carey, Subscriber

With the reduced natural gas costs that came from energy conservation measures, Julie, a self-proclaimed environmentalist, was curious about ways to further reduce costs and the environmental impact through renewable energy. Julie heard about the YVEA community solar program through the community newspaper and the Yampa Valley Sustainability Council. She signed up right away since the program would save her money, support the local economy, and help the environment.

"The more renewable energy the Valley can produce locally and conserve the better. There is a large demand for locally sourced renewables." Julie, Subscriber

After speaking with a GRID representative, Julie believed she could see significant electricity savings of between 30% and 50% a year by participating. These cost savings are extremely beneficial to her and her students.

While the marketing for the community solar project was strong, the sign-up process was not. Julie did not hear whether she was part of the program for multiple months after completing her paperwork. In addition, there was a large gap between signing up in November and receiving credits in April. Otherwise, Julie is thrilled to be part of the program and stated the process was smooth.

Estimated Versus Actual Performance

In 2016, Julie's household used 3,749 kWh and spent \$307.99 on electric bills. To offset usage, Julie's household was allocated 2.65 kW of solar energy. Julie expected the solar to offset approximately 100% of her electricity usage and about 30% of her costs.

In the first full three months of benefits she saw over 100% of her electricity usage offset and her electricity costs offset by 22%. The remaining 78% of costs on their bill was from the

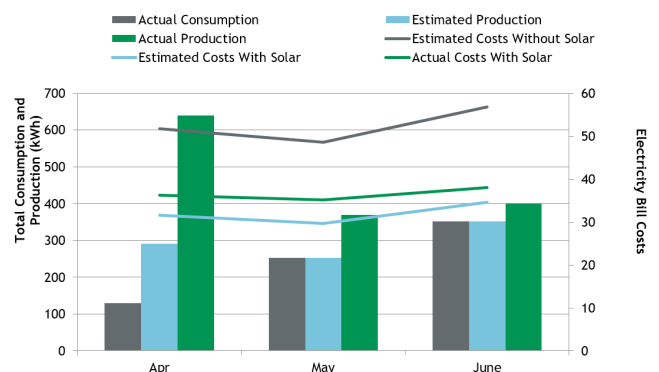
fixed monthly costs and the \$0.03 she pays per kWh to participate in the program.

Julie's final electricity costs and savings from participation in the program are a factor of the fixed fees that YVEA charges and the actual consumption of electricity in her household. On the first three months of the program Julie's normal electricity costs would have been \$126.66. Of that \$126.66, \$72 is fixed fees which are not affected by the community solar program. The remaining \$54.66 is the cost of electricity consumed by Julie which is effected by the community solar program. Since only 43% of Julies costs are related to consumption, the program can only make a limited impact on Julie's costs.

In future months Julie will experience significantly more savings since she uses more electricity during the fall and winter for heating; therefore, her consumption makes up a larger percentage of the bill compared to fixed fees. In addition, the YVEA community solar program allows Julie to roll over kWh credits from one month to the next. Julie can get credits by consuming less electricity then the allocation of the solar array produces. Therefore, any credits she accumulates can be attributed to future, more expensive energy intensive months. As of June 2017, Julie had accumulated 514 additional kWh of solar credits that will be applied to future months.



FIGURE 1: ESTIMATED VERSUS ACTUAL PRODUCTION FOR JULIE CAREY





Lessons Learned

SUCCESES

- The project has low operating costs and minimal O&M.
- The project supports YVEA's goal to produce more electricity locally.
- Subscriber electricity costs were reduced.
- The project provided much needed renewable energy experience to YVEA staff members.
- Lower electricity costs will help reduce the number of non-payments that YVEA will receive.
- When coupled with weatherization assistance program savings, this project has the potential to reduce energy costs by approximately 57%.

CHALLENGES

- Even with the CEO grant and GRID's support, it was difficult to provide maximum benefit to subscribers while balancing utility costs.
- YVEA's staff had a lack of experience with installing renewable energy systems.
- The qualification process took multiple months.

BEST PRACTICES

YVEA's case study provides insight on how to optimize future low-income community solar garden projects.

Utility local, trusted organizations. Since the Sustainability Council is a trusted organization by many low-income households in the community, it helped market the YVEA community solar array, in addition to its energy efficiency programs.

Set a realistic expectation of savings. YVEA believes that you must provide a realistic expectation of cost savings from the program upfront. They would recommend having a calculator during the qualification process to make sure each household has an accurate estimate of savings. Subscribers for the project had expected savings ranging from 16% to 74%.

Put a cap on the amount of solar each participant can subscribe to. Due to the small size of the array, YVEA thought it was important to put a cap on how much solar each participant could be allocated. For example, to offset 70% of one participant's electricity demand, YVEA would have had to allocate 12.43 kW (more than 7.5% of the total array) instead of the capped 5.3 kW to that household. By keeping

the distribution small, more households can benefit.

Install the array on utility-owned land. Installing the array on land owned by the utility and adjacent to utility headquarters can simplify interconnection and help to save costs.

Ensure consistent communication and expectations with subscribers. There were several lengthy delays because communications with subscribers left subscribers confused as to understanding whether the program was still moving forward. More consistent communication would have made the process smoother.

POLICY CONSIDERATIONS

Lessons learned from the YVEA community solar garden present the following policy considerations:

Fixed charges play a significant role in the potential for reducing energy costs. Community solar incentives are typically provided as bill credits – credits on utility bills – and are issued as a dollar per kWh amount at a value less than retail rates. Fixed charges are not affected. While a subscriber's bill will be reduced by the bill credit amount, the subscriber will always be responsible for paying fixed charges. The degree to which a subscriber's energy costs are reduced is a direct function of the amount of fixed charges relative to the cost of electricity. In YVEA's solar model, subscribers have a monthly fixed fee of \$27.50. This can lead to lower cost savings.

The solar payment structure affects subscriber's total cost savings. The amount that each subscriber pays to participate in community solar and associated escalation rates affect the subscriber's total savings. YVEA solar payments do not escalate even though electricity retail rate costs do. Therefore, the savings will grow over time as the solar payments stay constant and the retail rate increases. For example, YVEA subscribers in 2017 will save \$0.05321 per kWh, while subscribers in 2037 could save approximately \$0.09122 per kWh.

Capping the size of a subscriber's portion of the project will affect high-electricity user's potential savings. YVEA capped every subscriber at the less of 100% of their previous 12-month electricity use or 5.3kW. One subscriber's consumption would require a 17.7-kW system allocation using that sizing guidance. In return, the subscriber received only a 24% reduction in costs during the first month.

Project Snapshot

QUICK STATISTICS

- 165 kW solar garden
- Maximum 45 subscribers
- 80% subscribed
- All subscribers are eligible for WAP

UTILITY TYPE

- Cooperative
- Serves over 19,924 residents and businesses located in Eagle, Grand, Routt, and Moffat counties
- Receives wholesale electricity from Western Area Power Administration and Xcel Energy

ENERGY BURDEN

- Approximately 8% of residents in Eagle County, 8% in Grand County, 12% in Moffat County, and 9% on Routt County live below the poverty line, compared to a statewide average of 12%.

PROJECT GOALS

1. Reduce members' energy costs
2. Provide a local, resilient electricity source

3. Provide locked-in energy prices
4. Provide renewable energy and diversify energy supply
5. Enable YVEA staff to get hands-on experience

PROJECT PERFORMANCE

- On average, project expects approximately 42% cost savings and 70% electricity offset by solar
- Expected to produce 226,254 kWh annually
- To date, the system has produced 5% more electricity than expected.

PROJECT COSTS

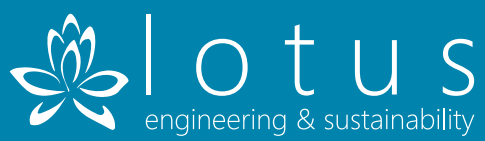
- Total project cost: \$333,416
- CEO grant: \$225,000
- YVEA contribution: \$108,416, plus in-kind support

SUBSCRIBER PAYMENT STRUCTURE

- Costs and credits for 2017:
 - o Retail rate \$0.08321/kWh
 - o Monthly fixed charges \$27.50
 - o Subscriber solar payment \$0.03/kWh



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